

1 WHAT IS CLAIMED IS:

SUB A1 > 1. An apparatus for generating an aerosol
5 encapsulant from a liquid comprising:
 a chamber having an outlet port;
 a reservoir in the chamber for containing a
 liquid having a liquid level;
 at least one transducer submerged in the liquid;
and
10 motive means for causing a flow of a carrier gas
to carry the aerosol from the chamber through the outlet
port.

15 2. The apparatus of claim 1 further comprising
means for adjusting the depth that the at least one
transducer is submerged below the liquid level.

20 3. The apparatus of claim 1 further comprising a
level controller for controlling the liquid level in the
reservoir.

25 4. The apparatus of claim 3 wherein the reservoir
is a primary reservoir and the level controller comprises:
 an overflow reservoir having a liquid level
 lower than the liquid level of the primary reservoir;
 a capture liquid recirculation pump for
transferring a capture liquid from the overflow reservoir
to the primary reservoir;
 an overflow weir for allowing the capture liquid
30 to spill over from the primary reservoir to the overflow
reservoir, thereby maintaining the liquid level of the
primary reservoir at an essentially constant level.

35 5. The apparatus of claim 4 wherein the level
controller further comprises a transducer height adjuster.

1 6. The apparatus of claim 1 further comprising six
transducers.

5 7. The apparatus of claim 1 wherein the carrier gas
is ambient air and the motive means comprises a fan.

10 8. The apparatus of claim 1 further comprising an
aerosol recovery system for recovering the aerosol from an
exhaust aerosol stream from the process area comprising a
spray bath for capturing the exhaust aerosol and producing
an exhaust stream.

15 9. The apparatus of claim 8 further comprising a
filter for filtering moisture from the exhaust stream.

20 10. The apparatus of claim 8 further comprising:
a nozzle for producing the spray bath;
a sump for containing a spray liquid used in
producing the spray bath; and
a spray liquid recirculation pump for
recirculating the liquid from the sump to the nozzle.

25 11. A method for collecting particulates from a
process area containing surfaces exposed to the
particulates, the method comprising the steps of:
generating an aerosol of a capture liquid; and
introducing the aerosol into the process area to
coat the surfaces of the process area and encapsulate and
adhere the particulates against the surfaces with the
aerosol.

30 12. The method of claim 11 wherein the step for
generating an aerosol further comprises the steps of:
providing a reservoir of capture liquid; and
35 subjecting the capture liquid to ultrasonic
waves.

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 ~~13~~. The method of claim ~~12~~¹⁴ wherein the capture
liquid has a liquid interface and the ultrasonic waves are
focused to a point near the interface.

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 ~~14~~. The method of claim ~~12~~¹⁴ wherein the ultrasonic
waves are provided in a frequency range of between about
1 kilohertz to about 2.3 megahertz.

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 ~~15~~. The method of claim ~~12~~¹⁴ wherein the ultrasonic
waves are selected to form an aerosol of droplets having
a mean diameter of about 2 microns.

 16. The method of claim 11 further comprising the
step of venting a portion of the aerosol from the process
area.

 17. The method of claim 16 further comprising the
step of recovering the portion of the aerosol vented from
the process area.

 18. The method of claim 17 wherein the step for
recovering the portion of the aerosol vented from the
process area comprises the step of passing the exhaust
stream through a spray bath.

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 ~~19~~. The method of claim ~~18~~²⁰ further comprising the
step of passing the exhaust stream through a filter.

 20. The method of claim 11 further comprising the
step of selecting a capture liquid that will form a tacky
layer on the surfaces of the process area.

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 ~~21~~. The method of claim ~~20~~² further comprising the
step of removing the encapsulated particulates from the
surfaces of the process area.

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22. The method of claim 11 further comprising the
step of selecting a capture liquid that will harden to the
surfaces of the process area.

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5 23. The method of claim 22 further comprising the
step of scraping the encapsulated particulates from the
surfaces of the process area.

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6 24. The method of claim 11 further comprising the
step of wiping the encapsulated particulates from the
surfaces of the process area.

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25. The method of claim 11 wherein the process area
contains air, and further comprising the step of selecting
a capture liquid that hardens to the surfaces of the
process area by oxidation.

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6 26. The method of claim 11 further comprising the
step of selecting a non-hazardous capture liquid.

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27. The method of claim 11 further comprising the
step of selecting a capture liquid that will form a hard,
durable layer of encapsulant on the surfaces of the
process area.

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28. The method of claim 11 wherein the particulates
are chemically reactive, the method further comprising the
step of selecting a capture liquid that will neutralize
the particulates.

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29. The method of claim 11 wherein the capture
liquid is provided in a reservoir within a pressurization
chamber and the step for introducing the aerosol to the
process area comprises the step of pressurizing the
pressurization chamber to induce flow of aerosol into the
process area.

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1 30. The method of claim ~~11~~ further comprising the
step of heating the capture liquid.

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5 31. The method of claim ~~11~~ further comprising the
step of coating the surfaces of the process area with a
resinous material after the particulates have been
encapsulated and adhered to the surfaces of the process
area.

10 32. A method for removing hazardous particles from
a space enclosed by walls, the method comprising the steps
of:

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15 supplying to a reservoir a liquid that can be
bound to the surface of the particles and to the walls;
atomizing the liquid to form particles
sufficiently small to act as a gas;

introducing the atomized liquid into the space
to encapsulate the particles and cause the encapsulated
particles to adhere to the walls.

20 33. The method of claim 32, in which the supplying
step supplies a liquid that hardens after exposure to the
space.

25 34. The method of claim 32, in which the space is
occupied by air and the supplying step supplies a liquid
that hardens by oxidation after exposure to the air in the
space.

30 35. The method of claim 32, in which the supplying
step supplies a liquid that is nonhazardous.

35 36. The method of claim 32, in which the atomizing
step comprises subjecting the liquid in the reservoir to
ultrasonic waves.

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 ~~31~~. The method of claim ~~32~~²², in which the atomizing
step comprises subjecting the liquid in the reservoir to
ultrasonic waves in the frequency range of 1 KHz to 2.3
MHz.

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 ~~36~~. The method of claim ~~32~~²², in which the atomizing
step comprises subjecting the liquid in the reservoir to
ultrasonic waves having characteristics that atomize the
liquid into droplets having a mean size of about 2
microns.

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 ~~38~~. The method of claim ~~32~~²², in which the reservoir
is located in a pressurization chamber and the introducing
step comprises pressurizing the chamber to create a flow
inducing pressure difference between the chamber and the
space.

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 ~~40~~. The method of claim ~~32~~²², additionally comprising
the step of heating the liquid in the reservoir.

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 ~~41~~. The method of claim ~~32~~²², additionally comprising
the step of mixing water vapor with the atomized liquid to
control its humidity.

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 ~~42~~. The method of claim ~~32~~²², additionally comprising
the step of coating the walls with a resinous material
after the encapsulated particles adhere to the walls.

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 ~~43~~. The method of claim ~~32~~²³, additionally comprising
the step of scraping the hardened liquid from the walls
after it adheres thereto to remove the encapsulated
particles with the hardened liquid.

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1 44. The method of claim 32, in which the atomizing
step comprises placing an ultrasonic transducer in the
reservoir below the surface of the liquid such that
5 ultrasonic waves emitted by the transducer is focused at
the surface.

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